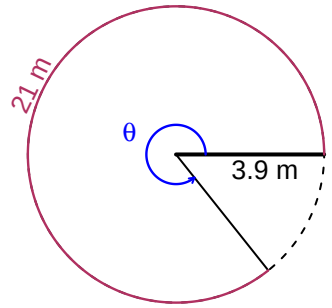
Name: Date:

Trig Final (SLTN v607)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 3.9 meters. The arc length is 21 meters. What is the angle measure in radians?

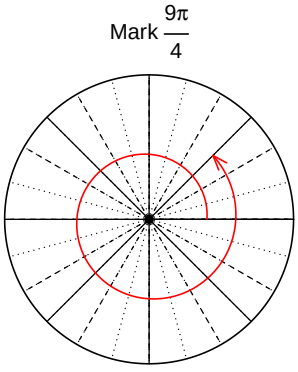


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

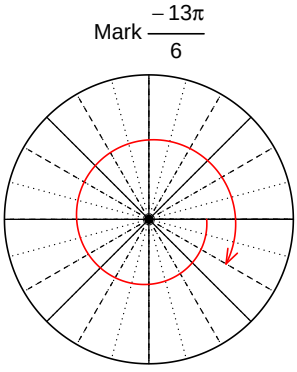
$\theta = 5.385$ radians.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(9\pi/4)$



Find $\cos(-13\pi/6)$

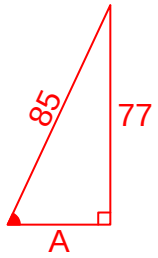
$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-77}{85}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

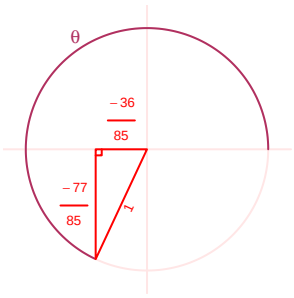
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 77^2 = 85^2$$
$$A = \sqrt{85^2 - 77^2}$$
$$A = 36$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-36}{85}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.78 Hz, an amplitude of 8.57 meters, and a midline at $y = -5.54$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.57\cos(2\pi 3.78t) - 5.54$$

or

$$y = 8.57\cos(7.56\pi t) - 5.54$$

or

$$y = 8.57\cos(23.75t) - 5.54$$